

LESSON 10

Title: Clam: It's a Shore Thing –Life Cycle - Session 2 of 3

Subjects:

- Career and Educational Development, Science, Health and Physical Education, History, ELA, Math, Social Studies

Grade level(s): 3-12+

Standard(s):

Maine Learning Results

- Career and Educational Development. Interpersonal Skills (A3.pre-k to diploma.a,c)
- ELA. Informational texts (A3.3.c); (A3.3.e); (A3.6.e); A3.9-diploma.b); Research (C1.3-5.a,c,d)(C1.6-8.g); (C1.9-diploma.a,c); Listening (E1.3-diploma.c); (E1. 9-diploma.a); Speaking (E2.3-8.d); (E2. 9-diploma.a)
- Health and Physical Education. Cooperative Skills (I1.pre-k to diploma.a-d); Responsible Behavior (I2.pre-k to diploma)
- Math. Data (B1.4-8.a,b); (B1.9-diploma); Measurement and Approximation (B1.4-diploma.a,b); (B1.9-diploma.a,b,c); (B2.3-6); (B2.7.1a, 1b); (B2.8-diploma.3)
- Science. Scientific Inquiry and Technological Design (B1.3-diploma.a); (B1.3-diploma.b); (B1.3-diploma.c); (B1.3-diploma.d); (C1.3-diploma.a)
- Social Studies. Taking Action Using Social Studies Knowledge and skills (A3.3-diploma)

Common Core:

- ELA. (V.3-12.6); (SL.3-12.1c); (SL.3-5.1); (L.3.5b);(L.3.5b)
- Science and Technology. (R.6-12.4); (R.7-12.4)

STEM Skills

Brief Description:

In three class sessions, one at the tidal flat and two in the classroom, the students will identify the major parts of the clam's shell, study the life cycle of the clam, and learn about the inner clam anatomy, using live clams, pictures, diagrams and a 3-D clam "pillow" (available at DEI and several Washington County schools).

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In this session, the instructor becomes the student and allows the students to “teach” the concepts presented to them in Session 1 on the field trip. Session 2 will then focus on the Life Cycle of a Clam.

Adaptations for different age levels/abilities:

If a diagram appears to have too many words for the students to identify or remember due to their ages, the instructor could provide the word labels that will suit the age group, and mention that there are many parts to the clam, but that for today, the class will focus on a few of them.

Objectives/goals:

After the completion of the activities, the students will:

- identify the parts of a clam (external anatomy)- review of Lesson 9 Session 1
- recognize the parts of a clam’s shell-review of Lesson 9 Session 1
- observe how a clam uses its foot to move-review of Lesson 9 Session1
- observe how a clam uses its siphons-review of Lesson 9 Session 1
- have an understanding of the life cycle of a clam

Time needed: One class session

Keywords:

Session 1 - External Anatomy: anterior end, excurrent siphon, foot, growth rings, hinge ligament, incurrent siphon, invertebrate, left valve (shell), mollusk, posterior end, siphon, stress ring, umbo

Session 2 – Life Cycle: adult clam, egg, fertilization, juvenile clam, late pediveliger, pediveliger, spat, sperm, trocophore, early veliger, veliger

Session 3 - Internal Anatomy and Digestive System: anterior adductor muscle, anus, crystalline style, digestive gland, digestive system, esophagus, excretory pore, excurrent siphon, foot (pedal), gill, gonad, heart, hinge line adductor scar, incurrent siphon, intestine, labial palp(s), mantle, mouth, nephridia (excretory gland), posterior adductor muscle, rectum, shell, stomach, style sac, visceral mass/visceral cavity

Additional general terms: anterior adductor muscle scar, bivalve, chondrophore, dorsal, muscle scar, pallial line, periostracum, plankton, posterior adductor muscle scar, straiæ, umbo, ventral

Materials Needed:

- Diagram of clam life cycle- Diagram of clam life cycle- (DEI. “Life Cycle of the Soft-Shell clam, *Mya arenaria*”. Print.)
- Blank life cycle chart from Education World
- “A work list of terms for the students to use when they become “instructors”

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- A class size life cycle diagram – Prepare ahead of time by enlarging-use an overhead projector or whiteboard-cut into puzzle pieces for the students to complete as a review of the concepts OR sketch the main outline of a life cycle chart using boxes and arrows on the blackboard or chart paper, leaving enough space for students to tape on their responses or sketches of the life cycle stages
- Empty clam shells to use for illustrating shell parts (One of each right valve and left valve for each student if possible)
- Clams (a few raw clams that were kept refrigerated after the field trip)
- Digital camera to take photos of activities (photos of students as they participate, which could be used later in a project presentation night or in the classroom to use as a basis for extension activities)
- Photos from DEI files. (Clam Foot 1, Veliger larvae stages with juvenile clam, Male clam spawning, female clam spawning)
- Labeling of clam parts diagram and inner shell diagram from <http://www.msc.ucla.edu/oceanglobe>; Lesson 11, Session 3
- Diagram of Inside shell and internal organs from <http://www.biodidac.bio.uottawa.ca>; Lesson 11 Session 3

The following resources provide other information:

- Life Cycle information sheet comes from (Abraham, Barbara J., and Perian L. Dillon. "Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic)". Fish and Wildlife Service U.S. Department of the Interior. (1986) 3-5. Print.
- A copy of the clam-shaped brochure that lists clam facts and information. Developed by the Sea Grant program. (White, Susan and MaJo Keleshian. "Maine's Soft-Shell Clams". Maine/New Hampshire Sea Grant Program and Beals Island Regional Shellfish Hatchery. MSG-E-98-1. Print.)
- A copy of the information on the soft shell clam. (Maine State. Maine Department of Marine Resources Education Division. "A Teacher's Guide to Marine Life of the Gulf of Maine". 2nd edition. 2004.13-16. Print)

The Procedure:

Introduction

CLASS SESSION 2

The Instructor will explain that in the lesson, the students will continue the activities that began when they took their field trip to the tidal flat. Today, the instructor will sit back and let the students recall and relate what they remember.

Give the students two empty shells (one of each valve if possible), and a live clam.

Key Questions

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Add more Session 2 questions as you work on the diagrams, depending on the age of the student

What does the clam do when it is placed in the sand? in the water?

What parts of the clam can you see? Can you see the foot? the siphons?

What is the purpose of the incurrent siphon? excurrent siphon?

How does the clam use its foot to move?

How many clam parts can you name?

Describe the main parts of the life cycle of the clam.

Main Activity

Allow the students to become the instructor(s) and using the **Work List** developed for this lesson, have them identify the parts of the shell while the instructor listens— umbo, chondrophore, hinge ligament, anterior end, posterior end, growth rings, stress rings, etc. from the key words, by having the students relate what they have remembered from the field trip demonstration. The Instructor should be prepared to repeat some information if necessary for the students.

Have the students contribute as much information as they can as a whole or in small groups, depending on the size and age of the students. (If the activity is to be in small groups, the instructor can go from group to group after allowing them a little prep and review time on their own to prepare their lesson).

After the students have taught their “lessons”, introduce the clam’s life cycle. Distribute copies of the life cycle listed in the materials. Discuss each of the major stages in the life cycle, as the students refer to their life cycle chart. Use photos as appropriate.

Important Life Cycle stages:

- **Sperm** and **eggs** are released from the male and female clams (see life cycle diagram). Once sperm and eggs are released, they float around in the water. If they are able to come in contact with each other, fertilization occurs and cell division starts.
- The **trochophore** develops within 6 to 12 hours. Discuss the parts seen in the diagram.
- Within the next 24 to 36 hours, the **veliger larva** develops. In this stage, the larvae floats through the water and feeds on phytoplankton. In the wild, **veligers** are eaten by many fish species at this time. The length of this stage varies in the research from 10 days to 6 weeks, depending on the water temperature. Clams growing in a hatchery have controlled water temperatures, and their growth is more constant.
- As the **veliger** stage progresses, a foot is developed which the clam will use for burrowing. The **byssal gland**, which secretes a sticky thread

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called the **byssus** is used by the clam to anchor itself to the sand. The young clam can move from place to place attaching itself by the byssus, and testing the sand with its foot, until it finds a location that seems suitable. Then it will use its foot to burrow into the sand where it usually remains.

- When the clam becomes an adult, in 1 to 2 years, the cycle of sperm and egg will begin again.

(Abraham, Barbara J., and Perian L. Dillon. "Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic)". Fish and Wildlife Service U.S. Department of the Interior. (1986) 3-5.Print.

Have them make sketches of one or two of the stages that they see, by looking at the pictures provided. Have the pictures in an accessible place. The students can go and look at the pictures, come back to their places and sketch what they see and be allowed to go back to the pictures as needed. Direct this activity so that at least one sketch is available of all stages.

The sketching activity could be going on with some groups as the instructor is going from group to group to be "taught"-this will on depend on the students' abilities to be working independently.

Use the pictures included with this lesson to illustrate some of the stages of the life cycle.

Conclusion

Conclude the lesson by having the students assemble individual life cycle diagrams, using their sketches and a blank life cycle chart (use a blackboard or chart paper).

Or the Instructor may have them assemble a class size chart on which several sketches are taped at each stage.

The Instructor can again become the student and allow them to put their sketches on the class size chart. The Instructor should let them complete the life cycle chart, giving information about each cycle as they go. Once they are sure their chart is correct, they will tell the instructor that they are finished. The Instructor or a student could write the key information for each developmental stage directly onto the blackboard or chart paper, or write in on separate paper and tape it to the chart.

The Instructor can assess their cycle chart at that time.

Assessment/Follow Up/Extension

On another day, the students could review the life cycle by having the students complete a "blank" life cycle chart together as a group. They will be able to review the concepts from Session 1 at the same time:

Prior to the review, the instructor could cover the large life cycle chart and "reveal" stages as the students recall them.